

ACCESSION #: 9904200382

NON-PUBLIC?: N

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palo Verde Nuclear Generating Station PAGE: 1 OF 7

Unit 1

DOCKET NUMBER: 05000528

TITLE: Reactor Trip On High Pressurizer Pressure Due To A Loss  
Of Heat Removal

EVENT DATE: 03/10/1999 LER #: 1999-001-00 REPORT DATE: 04/09/1999

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Daniel G. Marks, Section Leader TELEPHONE: (623) 393-6492

Regulatory Affairs

COMPONENT FAILURE DESCRIPTION:

CAUSE: X SYSTEM: SJ COMPONENT: COMP MANUFACTURER: F180

BV SB IICNTRL G080

REPORTABLE TO EPIX: Y

Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On March 10, 1999 at approximately 1325 MST, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION), operating at approximately 100% power, when a reactor trip occurred due to a loss of heat removal capability caused by improper operator intervention following a spurious closure of the main turbine control valves. An electrical malfunction caused the main turbine control valves to close decreasing the electrical load on the turbine. The steam bypass control system (SBCS) responded to maintain the loss of heat removal caused by the load shed. The control room supervisor directed the secondary operator to place the SBCS to emergency off which initiated a reduction in heat removal and resulted in a reactor coolant pressure increase to the high pressurizer pressure setpoint, subsequently tripping the reactor. In addition to the reactor trip, the unit received an engineered safety feature actuation system actuation of the main steam system (MSIS) on high steam generator-2 level due to the steam generator-2 economizer valve not staying fully closed and allowing level to reach the MSIS setpoint. At approximately 1335 MST, the unit was stabilized in Mode 3 (HOT STANDBY) and the shift manager classified the event as an uncomplicated reactor trip. All safety systems functioned as required. There were no other safety system actuations and none were required.

The preliminary cause of the turbine control valves going closed was a failure of the throttle pressure sensing circuit. An equipment root cause of failure is in progress. The cause of the reactor trip was attributed to supervisory methods that did not ensure sufficient information was collected to support an operational decision.

No previous similar events have been reported pursuant to 10CFR50.73.

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#### 1. REPORTING REQUIREMENT:

This LER 530/99-001-00 is being submitted to report an event that resulted in the automatic actuation of an engineered safety feature (ESF) (JE), including the reactor protection system (RPS) (JC) as specified in 10CFR50.73(a)(2)(iv). Specifically, on March 10, 1999, at approximately 1326 MST, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION), operating at approximately 100% power, when a reactor trip occurred following a spurious closure of the main turbine control valves (CV). An electrical malfunction caused the main turbine control valves to close decreasing the electrical

load on the turbine. The steam bypass control system (SBCS) responded to the loss of heat removal caused by the load shed. Operations personnel (utility-licensed operator) noted that all eight steam bypass control valves opened and concurrently verified no rod bottom lights were lit on the core mimic. The control room supervisor directed the secondary operator to place the SBCS in emergency off which initiated a reduction in heat removal and resulted in a reactor coolant pressure increase to the high pressurizer pressure setpoint, subsequently tripping the reactor. In addition to the reactor trip, the unit received an engineered safety feature actuation system (ESF) actuation of the main steam system (MSIS) on high level in steam generator-2 due to the steam generator-2 economizer valve not staying fully closed and allowing level to reach the MSIS setpoint. In accordance with 10CFR50.72(b)(2)(ii), at approximately 1645 MST on March 10, 1999, a one hour non-emergency ENS call (ENS ID 35456) was made for a RPS/ESF actuation.

## 2.EVENT DESCRIPTION:

Prior to the automatic trip, at approximately 1325 MST on March 10, 1999, control room personnel observed EHC and other alarms via the RJ computer screen. Subsequently, all eight steam bypass control system (SBCS) permissives activated and turbine bypass control valves quick opened.

Control room personnel observed no trip annunciators on the main turbine, no rod bottom lights lit, no CEAs inserted on the CEAC CRT screen, and no reactor power cutback, concurrent with the SBCVs opening and suspected a

possible overpower event was occurring and placed the SBCS in emergency off. As a result of the decrease in heat removal, reactor pressure increased to the high pressurizer pressure setpoint 2283 psia and at approximately 1326 MST, the reactor automatically tripped on high pressurizer pressure. All control element assemblies (CEA) (AA) inserted as designed. The reactor trip initiated a main turbine/main generator trip (TA/TB). Secondary system pressure was discharged briefly via atmospheric dump valves (ADVs) and main steam safety valves (MSSVs). The total discharge duration was approximately 12 minutes of which 4 minutes were on the safeties.

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## 2. EVENT DESCRIPTION cont'd:

The unit was stabilized at approximately 1335 MST in Mode 3 (Hot Standby) and the Shift Manager classified the event as an uncomplicated reactor trip. At approximately 1429 MST a main steam isolation signal (MSIS) safety system actuation occurred due to high steam generator-2 level. The level in steam generator-2 increased to the MSIS setpoint of 91 percent narrow range. The level increase in steam generator-2 occurred approximately five minutes after the secondary operator placed both downcomer valves in the automatic position. The cause of the level increase was due to a faulty timer card for the economizer control valve. There were no other safety system actuations and none were required. Required safety systems responded to the event as designed. The timer card

was tested and re-installed. An equipment root cause of failure is underway to determine the problem.

### 3. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS EVENT:

A safety limit evaluation was performed as part of the APS investigation.

The evaluation determined that the plant responded as designed, that no safety limits were exceeded, and that the event was bounded by the current safety analysis.

The reactor trip did not result in a transient more severe than those already analyzed in Chapter 15 of the Updated Final Safety Evaluation Report (UFSAR). Scenarios concerning a decrease in heat removal by the secondary system or loss of normal feedwater flow remain bounding for this event. All CEAs inserted as designed. This event did not challenge shutdown margin criteria. Both primary and secondary system pressures remained well below 110 percent of the design pressures. Four main steam safety valves lifted for approximately 4 minutes during the event.

Engineering review of the safety valve performance indicated that all four safety valves performed as required. Post trip testing of safety valve performance is discussed in the additional information section 8. The specified acceptable fuel design limits (SAFDL) were not exceeded during this event. The plant response was normal for the situation that occurred.

The event did not result in any challenges to the fission product barriers or result in the release of radioactive materials in excess of quantities allowed by 10CFR20. Therefore, there were no adverse safety consequences

or implications as a result of this event. This event did not adversely affect the safe operation of the plant or the health and safety of the public.

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#### 4. CAUSE OF THE EVENT:

An independent investigation of this event is being conducted in accordance with the APS corrective action program. The investigation determined that the reactor tripped due to high pressurizer pressure when secondary heat removal was reduced by operations placing the SBCS to emergency-off. A preliminary evaluation has determined the apparent root cause to be personnel error in that supervisory methods did not ensure that sufficient information was collected to support operations decision to place the SBCS in emergency-off. The apparent cause of the turbine control valves closing was a failure of the throttle pressure sensing circuit. An equipment root cause evaluation is underway for this issue. The apparent cause of the post trip MSIS was due to a faulty timer card that controls the steam generator economizer valves. During the event the negative ten percent signal to the economizer valve was lost. The loss of the signal was due to loss of power to the card through its back plate connector. The card was removed and tested in the rework shop and performed satisfactory. The card was re-installed in the field panel and tested several times and functioned properly. An equipment root cause evaluation is underway for this issue. No unusual characteristics of the work location (e.g., noise, heat, poor

lighting) directly contributed to the event. No procedural errors contributed to the event.

#### 5. STRUCTURES, SYSTEMS, OR COMPONENTS INFORMATION:

An independent investigation of this event is being conducted in accordance with the APS corrective action program. The investigation has determined that the reactor automatically tripped on high pressurizer pressure following the spurious closing of the main turbine control valves causing a large load reduction. A preliminary root cause of failure analysis (ERCFA) determined that the apparent root cause of the main turbine control valves closing is attributed to an electronic failure in the throttle pressure sensing circuit which controls valve position and regulates steam flow to the main turbine. The failure of the sensing circuit caused all four main turbine control valves to close. The failed pressure sensing circuit is currently in the instrument and control rework facility to determine the specific failure mode. A new pressure sensing circuit was installed and turbine control valves were returned to service. If the final ERCFA results differ from this determination, a supplement to this report will be submitted to describe the final root cause determination. A transportability review was conducted for Units 2 and 3 to determine if a potential failure of the pressure sensing circuit exists. No abnormal failure modes or repetitive problems were discovered.

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5. STRUCTURES, SYSTEMS, OR COMPONENTS INFORMATION cont'd:

An evaluation was also conducted to determine the cause of the MSIS. A preliminary ERCFA determined that the apparent root cause for the MSIS, post trip, was due to a problem with the timer card on the feedwater control system causing the steam generator-2 economizer valve to remain open approximately 1 percent, increasing the level in steam generator-2 to the high setpoint for MSIS. During the event the negative ten percent signal to the economizer valve was lost. The loss of the signal was due to loss of power to the card through its back plate connector. The card was re-installed in the field panel and tested several times and functioned properly. This card is normally inactive during normal operations and is needed during feedwater crossover or during post trip conditions. The risk of a timer card failure during normal operations is low. After extensive troubleshooting efforts, the problem with the card could not be repeated and was determined to be satisfactory for reinstallation. The timer card was re-installed in the system for continued use. A root cause evaluation is underway to determine the failure mode. A transportability review will be conducted as part of the ERCFA.

The timer card is manufactured by Foxboro and is a Spec 200 part number KY354F2.

There are no indications that any structures, systems, or components were inoperable at the start of the event, which contributed, to the event. No other component or system failures were involved. No failures of components with multiple functions were involved. No failures that



rendered a train of a safety system inoperable were involved.

#### 6. CORRECTIVE ACTIONS TO PREVENT RECURRENCE:

As immediate corrective action, the control room supervisor was removed from shift duties for diagnostics skills training. A human performance evaluation (HPES) is underway to determine personnel performance issues surrounding the event. Preliminary results from the HPES indicate that the primary cause was inadequate operator response in that the control room staff did not fully evaluate plant parameters prior to making the decision to place the SBCS in emergency-off. The evaluation also concluded that operations procedures, command and control, communications, shift staffing and stress levels were all satisfactory and did not contribute to the event. If the final HPES evaluation results differ from those previously stated, a supplement to this report will be submitted to describe the final HPES determination.

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#### 6. CORRECTIVE ACTIONS TO PREVENT RECURRENCE cont'd:

An ongoing evaluation is being conducted in accordance with the APS Corrective Action Program to address the root cause of failure for the main turbine control valve and steam generator economizer control valve failures.

As immediate corrective action, the main turbine control valve throttle pressure sensing circuit was replaced. An ERCFA is underway to determine the failure mode and will be completed by July 30, 1999.

During the event the negative ten percent signal to the economizer valve was lost. The loss of the signal was due to loss of power to the card through its back plate connector. The card was re-installed in the field panel and tested several times and functioned properly. The timer card for the steam generator economizer control valve was tested satisfactorily, re-installed and returned to service. After extensive troubleshooting efforts, the problem with the card could not be repeated and was determined to be satisfactory for reinstallation. The timer card was re-installed in the system for continued use. A root cause evaluation is underway to determine the failure mode and will be completed by July 30, 1999. A transportability review will be conducted as part of the ERCFA.

To enhance operator awareness of the anomalies associated with this event, the lessons learned will be placed in the Licensed Operator Continued Training (LOCT). As part of LOCT, additional training will be given on anomalies associated with isolation of the steam generator economizer valves by August 15, 1999. Operations management will evaluate the need for additional diagnostic skills training for licensed operators following completion of the HPES evaluation by June 30, 1999.

#### 7. PREVIOUS SIMILAR EVENTS:

Although previous similar events have been reported pursuant to 10CFR50.73 in the past three years for automatic actuation of an ESF, including RPS, the causes discussed in the previous events have not been similar to this event. Therefore, the corrective actions taken to address previous similar

events would not have prevented this event.

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## 8. ADDITIONAL INFORMATION

Unit Restart Based on the contingency action plan and on reviews by the Plant Review Board, the Management Response Team, and the Incident Investigation Team, unit restart was authorized by the Operations Director in accordance with approved procedures. At approximately 2228 on March 12, 1999, Unit 1 entered Mode 1, and at approximately 0121 MST on March 13, 1999 Unit 1 was synchronized on the grid.

### MSSV Performance

Subsequent to the reactor trip, secondary system pressure rose above 1250 psig resulting in the operation of four MSSVs. Based on available instrument readings, four MSSVs lifted within their expected lift pressure settings and limited secondary peak pressure to approximately 1282 psig during the event. One MSSV (SGE-PSV-561), with a design lift of 1250 psig, did not lift during the event. Engineering performed an evaluation of SGE-PSV-561 performance and determined that the actual steam line pressure that this valve experienced during the event may not have been sufficient to cause it to lift. Post trip testing was conducted for this MSSV to confirm the lift setting was within Technical Specification acceptance limits. The as found lift setting was determined to be approximately 3.8 percent above the design lift pressure which is outside the Technical Specification limit. The MSSV was declared inoperable at approximately

1434 MST, on March 13, 1999 and the lift settings were adjusted and returned to service within the LCO completion time. Although SGE-PSV-561 post trip test results were outside of Technical Specification limits, there were no safety consequences as a result of this condition in that the MSSVs performed as expected during the event and prevented over-pressurization of the secondary system.

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APS

Commitment. Innovation. Energy

Palo Verde Nuclear

Generating Station

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192-01042-GRO/DGM/RJH

April 9, 1999

U. S. Nuclear Regulatory Commission

ATTN: Document Control Desk

Mail Station P1-37

Washington, D.C. 20555-0001

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)

Unit 1

Docket No. STN 50-528

License No. NPF-41

Licensee Event Report 99-001-00

Attached please find Licensee Event Report (LER) 99-001-00 prepared and submitted pursuant to 10 CFR 50.73. This LER reports an automatic reactor trip on high pressurizer pressure due to a loss of heat removal. In addition to the reactor trip, the unit received an engineered safety feature actuation of the main steam system (MSIS) on high steam generator water level. There are no commitments generated as a result of this LER.

In accordance with 10CFR50.73(d), a copy of this LER is being forwarded to the Regional Administrator, NRC Region IV. If you have any questions, please contact Daniel G. Marks, Section Leader, Regulatory Affairs, at (623) 393-6492.

Sincerely,

GRO/DGM/RJH/rh

Attachment

cc: E. W. Merschoff (all with attachment)

P. H. Harrell

M. B. Fields

J. H. Moorman

INPO Records Center

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